

WHAT IS CLAIMED IS:

1. A method for forming a nitride semiconductor device, comprising:
 - (a) growing one or more gallium nitride (GaN) layers on a substrate; and
 - (b) growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers to
- 5 form at least one quantum well ranging in width from approximately 20 Å to approximately 70 Å.
2. The method of claim 1, wherein a maximum emission intensity is associated with a quantum well width of approximately 50 Å.
- 10 3. The method of claim 1, wherein the quantum well has an optimal width of 52 Å.
4. The method of claim 1, wherein a resistive nature of the GaN layers
- 15 prevents band edge emission at room temperature, resulting in emissions only from the quantum well.
5. The method of claim 1, wherein the GaN layers are non-polar a-plane GaN layers and the substrate is an r-plane substrate.
- 20 6. The method of claim 1, wherein the substrate is a sapphire substrate.
7. The method of claim 1, wherein the growing step (a) comprises:
 - (1) annealing the substrate;
 - 25 (2) depositing a nitride-based nucleation layer on the substrate;
 - (3) growing the GaN layer on the nucleation layer; and
 - (4) cooling the GaN under a nitrogen overpressure.

8. The method of claim 1, wherein the growing steps are performed by a method selected from a group comprising metalorganic chemical vapor deposition (MOCVD), molecular beam epitaxy (MBE), liquid phase epitaxy (LPE), hydride vapor
5 phase epitaxy (HVPE), sublimation, and plasma-enhanced chemical vapor deposition (PECVD).

9. A device manufactured using the method of claim 1.

10 10. A nitride semiconductor device, wherein the nitride semiconductor device is created using a process comprising:

- (a) growing one or more gallium nitride (GaN) layers on a substrate; and
- (b) growing one or more non-polar (Al,B,In,Ga)N layers on the GaN layers to
15 form at least one quantum well ranging in width from approximately 20 Å to approximately 70 Å.

11. A nitride semiconductor device, comprising:

- (a) one or more gallium nitride (GaN) layers grown on a substrate; and
- (b) one or more quantum wells formed from one or more non-polar (Al,B,In,Ga)N
20 layers grown on the GaN layers, wherein the quantum well has a width ranging from approximately 20 Å to approximately 70 Å.